Inside the Intestine

Use microscope evidence to distinguish four tissue types.

HAP.2.1 "Analyze the characteristics of the four main tissue types: epithelial, connective, muscle, and nervous. Examine tissues using microscopes and other various technologies."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one visible characteristic of each tissue type, then circle the words that describe its job. Number the four tissue types as you find them so you can compare their evidence.

A Closer Look at the Intestinal Wall

1. A biopsy of the small intestine arrives at a pathology lab. A thin slice of tissue is stained and placed under a light microscope. At low power, the inner surface looks folded, with many fingerlike projections called villi. The villi increase the area available for absorbing digested nutrients. Zooming in shows a continuous layer of tightly packed cells lining each villus. This epithelial tissue forms a boundary between food in the intestine and the body. Its cells absorb nutrients, while the close fit between neighboring cells helps control what crosses the lining.

2. Below the lining, connective tissue supports each villus. Its cells are more spread out than the lining cells, with material between them called extracellular matrix. Small blood vessels run through this supporting tissue and carry away absorbed nutrients. Deeper in the wall, smooth muscle cells form sheets. Unlike the stationary lining, these long cells can shorten. Their repeated contractions mix food with digestive juices and move it along the intestine. A student might mistake a band of smooth muscle for connective tissue at low power, but a closer view shows rows of elongated muscle cells rather than widely spaced cells in a matrix.

3. Nervous tissue is harder to identify on the same slide. In a second image made with a stain that highlights nerve cells, clusters of neurons and their branching extensions appear between muscle layers. Nearby supporting cells help maintain the neurons. These nerve networks relay signals that help coordinate muscle contractions and fluid release. The light microscope reveals cell arrangement, but staining can make a particular tissue easier to see. Comparing images at the same scale helps the observer connect shape, position, and job instead of judging a tissue by color alone. Together, the four tissue types support absorption and movement.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does the arrangement of epithelial cells help the intestinal lining do its job?

2. At higher power, how could you tell connective tissue from smooth muscle? Include what each tissue does in the intestine.

3. Why is the second stained image useful for finding nervous tissue? What does that tissue do?

4. A student identifies a tissue by its stain color alone. What two other kinds of evidence from the passage should the student check, and why?

3 YOUR TURN

Your own words

A lab partner claims that stain color is enough to identify every tissue. Write a short lab plan explaining how you would use microscope views to distinguish all four tissue types in an intestinal sample. Include one possible mix-up and how you would resolve it.

ANSWER KEY

Inside the Intestine

PART 1 · READ AND MARK

Underline one visible characteristic of each tissue type, then circle the words that describe its job. Number the four tissue types as you find them so you can compare their evidence. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does the arrangement of epithelial cells help the intestinal lining do its job?	**Tightly packed epithelial cells form a continuous boundary that absorbs nutrients while helping control what crosses the lining.**
2	At higher power, how could you tell connective tissue from smooth muscle? Include what each tissue does in the intestine.	**Connective tissue has spread-out cells in a matrix and supports villi. Smooth muscle has rows of elongated cells that shorten to mix and move food.**
3	Why is the second stained image useful for finding nervous tissue? What does that tissue do?	**The stain highlights clusters of neurons and their branching extensions between muscle layers. Their networks relay signals that help coordinate contractions and fluid release.**
4	A student identifies a tissue by its stain color alone. What two other kinds of evidence from the passage should the student check, and why?	**The student should check cell arrangement and location. Comparing those features helps distinguish tissues even when color alone is misleading.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would scan the slide at low power to find the villi and the deeper wall, then switch to higher power to compare cell arrangements. A tightly packed lining suggests epithelium, while spread-out cells in a matrix suggest connective tissue. I would look for rows of elongated cells that can contract in the muscle layers. I might confuse muscle with connective tissue at low power, so I would check the cells more closely. I would compare a nerve-stained image to find branching neurons between muscle layers.

Accept equivalent descriptions that link visible structure or location to function. In Part 3, look for a workable comparison of all four tissues and a specific way to resolve the proposed mix-up.